



GIRRAWEEN HIGH SCHOOL

YEAR 11 - TASK 1

2005

MATHEMATICS

2 UNIT

Time allowed – 90 minutes

DIRECTIONS TO CANDIDATES

- Attempt ALL questions.
- All necessary working should be shown in every question. Marks may be deducted for careless or badly arranged work.
- Board-approved calculators may be used.
- Start each question on a *new* sheet of paper.

Question 1 (16 marks)

- (a) Find $\frac{\sqrt{34 \div 5.9}}{21 - 4.7}$ correct to 3 decimal places. 1
- (b) Evaluate $\sqrt[3]{\frac{73.1}{0.2}}$ correct to 2 significant figures. 1
- (c) Write 0.01072 in scientific notation. 1
- (d) Fully simplify $\sqrt{245}$. 2
- (e) If $\sqrt{12} - \sqrt{3} = x\sqrt{3}$, find the value of x . 2
- (f) Which of the following $\pi, \sqrt{1}, -\sqrt{9}, \sqrt{3}, 2^{-1}, 5^{\frac{1}{2}}, 8^{-\frac{1}{3}}$ are rational numbers. 3
- (g) Express the following as a fraction in simplest form.
- (i) $0.\dot{3}8\dot{4}$ 3
- (ii) $6.\dot{2}4\dot{7}$ 3

Question 2 (24 marks)

- (a) Simplify.
- (i) $\sqrt{50} - \sqrt{32}$ 2
- (ii) $2\sqrt{3} + \sqrt{27} - \sqrt{243}$ 2
- (iii) $\frac{5\sqrt{2} \times 6\sqrt{10}}{3\sqrt{5}}$ 3
- (b) Expand and simplify.
- (i) $4\sqrt{3}(3\sqrt{6} + 2\sqrt{12})$ 2
- (ii) $(5\sqrt{2} - 3)^2$ 3
- (c) Express with a rational denominator.
- (i) $\frac{2\sqrt{3}}{\sqrt{7}}$ 2
- (ii) $\frac{4}{2 - \sqrt{7}}$ 3
- (iii) $\frac{3\sqrt{2}}{\sqrt{3} + \sqrt{5}}$ 3
- (iv) $\frac{7\sqrt{5} - 1}{7\sqrt{5} + 1}$ 4

Question 3 (22 marks)

- (a) Expand and simplify
- (i) $-3a^2\left(2a - \frac{b^2}{a}\right) - 5a(b^2 + 3a)$ 2
- (ii) $(3y^2 - 2)(3y^2 + 2)$ 2
- (iii) $(x + 2)(x^2 - 2x + 4)$ 2
- (iv) $(x + 2)(x - 4)^2$ 3
- (b) Factorise.
- (i) $4m^2 - 25$ 2
- (ii) $x^2 - 4xy - 60y^2$ 2
- (iii) $2y^2 + 11y - 21$ 3
- (iv) $r^3 - 27$ 3
- (v) $4 - 16a^4$ 3

Question 4 (19 marks)

- (a) Simplify
- (i) $\frac{c}{4} - \frac{c}{6}$ 2
- (ii) $\frac{1}{x-2} - \frac{1}{x}$ 3
- (iii) $\frac{2}{x+3} + \frac{x}{x-2}$ 3
- (b) Simplify
- (i) $\frac{1-x}{x^2-1}$ 3
- (ii) $\frac{x^3 + 4x^2 - 4x - 16}{x^2 + 6x + 8}$ 4
- (iii) $\frac{a^2 + b}{a + b} \div \frac{a^4 - b^4}{a^2 + 2ab + b^2}$ 4

Question 5 (20 marks)

- (a) Solve
- (i) $28 = 12x - 5x$ 2
- (ii) $(2x - 1)(x + 3) = 0$ 2
- (iii) $\frac{9}{2x} = 4 - \frac{3}{x}$ 3
- (iv) $4x^2 + 4x - 15 = 0$ 4
- (b) Complete the following
 $x^2 + 16x + \dots = (x + \dots)^2$ 2
- (c) Solve by completing the square
 $x^2 + 4x = 1$ 4
- (d) Solve by using the quadratic formula
 $2x^2 + 4x - 7 = 0$ 3

Question 6 (18 marks)

- (a) Solve the following
- (i) $-2x \leq 4$ 1
- (ii) $\frac{2x}{3} < x + 2$ 2
- (iii) $|4x + 3| = 15$ 2
- (iv) $\left| \frac{x+1}{2} \right| \geq 6$ 3
- (b) Solve simultaneously
- (i) $x + 2y = 10$
 $x - y = 1$ 3
- (ii) $5x + 2y = 11$
 $x - 5y = 13$ 3
- (iii) $y = x^2 + 3$
 $y = 4x$ 4

Yr 11 - Mathematics
Task 1 (2005)

SOLUTIONS

Q1 a) 0.147 (3 dec. pls.) ①

b) 7.1 (2 sign. fig.) ①

c) 1.072×10^{-2} ①

d) $\neq \sqrt{49 \times 5}$
 $= 7\sqrt{5}$ ②

e) $2\sqrt{3} - \sqrt{3} = x\sqrt{3}$
 $1\sqrt{3} = x\sqrt{3}$
 $x = 1$ ②

f) $\sqrt{1}, -\sqrt{9}, 2^{-1}, 8^{\frac{1}{3}}$ ③

g) (i) $x = 0.38\dot{4}$
 $100x = 38.44\dots$
 $1000x = 384.44\dots$
 $1000x - 100x = 384.44\dots - 38.44\dots$
 $900x = 346$
 $x = \frac{346}{900} = \frac{173}{450}$ ③

(ii) $x = 6.\dot{2}4\dot{7}$
 $1000x = 6247.247247\dots$
 $1000x - x = 6247.247247\dots - 6.247247\dots$
 $999x = 6241$
 $x = \frac{6241}{999} = 6 \frac{247}{999}$ ③

Q2 a) (i) $5\sqrt{2} - 4\sqrt{2} = \sqrt{2}$ ②

(ii) $2\sqrt{3} + 3\sqrt{3} - 9\sqrt{3} = -4\sqrt{3}$ ②

(iii) $= \frac{30\sqrt{20}}{3\sqrt{5}} = \frac{10\sqrt{20}}{\sqrt{5}}$
 $= \frac{20\sqrt{5}}{\sqrt{5}}$
 $= 20$ ③

b) (i) $= 12\sqrt{18} + 8\sqrt{36}$
 $= 36\sqrt{2} + 48$ ②

(ii) $= 25\sqrt{4} - 2 \times 15\sqrt{2} + 9$
 $= 50 - 30\sqrt{2} + 9$
 $= 59 - 30\sqrt{2}$ ③

c) (i) $\frac{2\sqrt{3}}{\sqrt{7}} \times \frac{\sqrt{7}}{\sqrt{7}} = \frac{2\sqrt{21}}{7}$ ②

(ii) $\frac{4}{2-\sqrt{7}} \times \frac{2+\sqrt{7}}{2+\sqrt{7}} = \frac{8+4\sqrt{7}}{4-7}$
 $= \frac{8+4\sqrt{7}}{-3}$ ③

(iii) $\frac{3\sqrt{2}}{\sqrt{3}+\sqrt{5}} \times \frac{\sqrt{3}-\sqrt{5}}{\sqrt{3}-\sqrt{5}} = \frac{3\sqrt{6}-3\sqrt{10}}{3-5}$
 $= \frac{3(\sqrt{6}-\sqrt{10})}{-2}$ ③

(iv) $\frac{7\sqrt{5}-1}{7\sqrt{5}+1} \times \frac{7\sqrt{5}-1}{7\sqrt{5}-1} = \frac{49\sqrt{25}-2 \times 7\sqrt{5}+1}{49\sqrt{25}-1}$
 $= \frac{245-14\sqrt{5}+1}{245-1}$
 $= \frac{246-14\sqrt{5}}{244}$
 $= \frac{2(123-7\sqrt{5})}{244}$
 $= \frac{123-7\sqrt{5}}{122}$ ④

$$\textcircled{Q3} \text{ a) (i) } -6a^3 + 3ab^2 - 5ab^2 - 15a^2$$

$$= -6a^3 - 2ab^2 - 15a^2 \quad \textcircled{2}$$

$$\text{(ii) } 9y^4 - 4 \quad \textcircled{2}$$

$$\text{(iii) } x^3 + 8 \quad \textcircled{2}$$

$$\text{(iv) } (x+2)(x^2 - 8x + 16)$$

$$= x^3 - 8x^2 + 16x + 2x^2 - 16x + 32$$

$$= x^3 - 6x^2 + 32 \quad \textcircled{3}$$

$$\text{b) (i) } (2m+5)(2m-5) \quad \textcircled{2}$$

$$\text{(ii) } (x-10y)(x+6y) \quad \textcircled{2}$$

$$\text{(iii) } 2y^2 + 14y - 3y - 21$$

$$= 2y(y+7) - 3(y+7)$$

$$= (y+7)(2y-3) \quad \textcircled{3}$$

$$\text{or } \begin{array}{r} (2y \quad -3) \\ y \quad +7 \end{array} \left| \begin{array}{r} -3y \\ +14y \\ \hline 11y \end{array} \right.$$

$$\text{(iv) } (r-3)(r^2 + 3r + 9) \quad \textcircled{3}$$

$$\text{(v) } 4(1-4a^4)$$

$$= 4(1-2a^2)(1+2a^2) \quad \textcircled{3}$$

$$\textcircled{Q4} \text{ a) (i) } \frac{6c}{24} - \frac{4c}{24} = \frac{2c}{24} = \frac{c}{12} \quad \textcircled{2}$$

$$\text{(ii) } \frac{x}{x(x-2)} - \frac{(x-2)}{x(x-2)}$$

$$= \frac{2}{x(x-2)} \quad \textcircled{3}$$

$$\text{(iii) } \frac{2(x-2)}{(x+3)(x-2)} + \frac{x(x+3)}{(x+3)(x-2)}$$

$$= \frac{2x-4 + x^2+3x}{(x+3)(x-2)}$$

$$= \frac{x^2+5x-4}{(x+3)(x-2)} \quad \textcircled{3}$$

$$\text{b) (i) } \frac{-(x-1)}{(x-1)(x+1)}$$

$$= \frac{-1}{x+1} \quad \textcircled{3}$$

$$\text{(ii) } \frac{x^2(x+4) - 4(x+4)}{(x+4)(x+2)}$$

$$= \frac{(x+4)(x^2-4)}{(x+4)(x+2)}$$

$$= \frac{(x+2)(x-2)}{x+2}$$

$$= x-2 \quad \textcircled{4}$$

$$\text{(iii) } \frac{(a^2+b)}{(a+b)} \times \frac{(a+b)^2}{(a^2+b^2)(a^2-b^2)}$$

$$= \frac{(a^2+b)(a+b)}{(a^2+b^2)(a+b)(a-b)}$$

$$= \frac{a^2+b}{(a^2+b^2)(a-b)} \quad \textcircled{4}$$

Q5 a) (i) $28 = 7x$
 $x = 4$ (2)

(ii) $x = \frac{1}{2}, -3$ (2)

(iii) $9 = 8x - 6$
 $15 = 8x$
 $x = \frac{15}{8} = 1\frac{7}{8}$ (3)

(iv) $0 = 4x^2 - 6x + 10x - 15$

$0 = 2x(2x-3) + 5(2x-3)$

$0 = (2x-3)(2x+5)$

$\therefore x = \frac{3}{2}, -\frac{5}{2}$

or $(x = 1\frac{1}{2}, -2\frac{1}{2})$ (4)

b) $x^2 + 16x + \underline{64} = (x + \underline{8})^2$ (2)

c) $x^2 + 4x + \underline{4} = \underline{1} + \underline{4}$

$(x+2)^2 = 5$

$x+2 = \pm\sqrt{5}$

$x = \underline{-2 \pm \sqrt{5}}$ (4)

d) $x = \frac{-4 \pm \sqrt{4^2 - 4(2)(-7)}}{2(2)}$

$= \frac{-4 \pm \sqrt{16 + 56}}{4}$

$= \frac{-4 \pm 6\sqrt{2}}{4}$

$x = \underline{\frac{-2 \pm 3\sqrt{2}}{2}}$ (3)

Q6 a) (i) $x \geq -2$ (1)

(ii) $2x < 3x + 6$

$-6 < x$

$x > -6$ (2)

(iii) $4x + 3 = 15$
 $4x = 12$
 $x = 3$

$4x + 3 = -15$
 $4x = -18$
 $x = -4\frac{1}{2}$ (2)

(iv) $\frac{x+1}{2} \geq 6$
 $x \geq 11$

$\frac{x+1}{2} \leq -6$

$x \leq -13$ (3)

(b) (i) $x + 2y = 10$ (1)

$x - y = 1$ (2)

(1) - (2) $3y = 9$

$y = 3$

sub $y=3$ into (1)

$x + 2(3) = 10$

$x = 4$

$(4, 3)$ (3)

(ii) $5x + 2y = 11$ (1)

$x - 5y = 13$ (2)

(2) $\times 5$ $5x - 25y = 65$ (3)

(1) - (3) $27y = -54$

$y = -2$

sub $y=-2$ into (2)

$x - 5(-2) = 13$

$x + 10 = 13$

$x = 3$

$(3, -2)$ (3)

(iii) $y = x^2 + 3$ (1)

$y = 4x$ (2)

Sub (1) into (2) $x^2 + 3 = 4x$

$x^2 - 4x + 3 = 0$

$(x-1)(x-3) = 0$

$\therefore x = 1, 3$

sub

$x=1, 3$ into (2)

$y = 4(1) \text{ \& } y = 4(3)$

$y = 4, 12 \therefore (1, 4) \text{ \& } (3, 12)$ (4)